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and west, and north and south from the pyramids." "According to Latrobe, the mounds extend for miles towards Tezcuco; and Waddy Thompson is confident that they are the ruins of an ancient city nearly as large as Mexico"

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THE GRAY RABBIT (LEPUS SYLVATICUS).

BY SAMUEL LOCKWOOD.

(Continued from November number.)

THE thrifty house-dame, who has a way of "culling simples" for her cuisine and leech-craft, feels badly hurt when the spring discloses the fact that of her savory pot-herbs the finest tussock has been used by a rabbit as a form through the winter, and the whole middle of it has been killed by the heat of the occupant's body. In a friend's garden a large mat of thyme was thus nearly ruined. Who has not heard of improvident humans eating themselves out of house and home? What self-possession and decorous restraint in this our little solitaire. However pinching the winter's cold and scarce the food, Coney keeps a wise care for his covert from the storm.

In some things certainly the gray rabbit is quite particular, and sometimes too much so for its own good. So inquisitorious is it of small things on the way, that when in full retreat before the dog, the whistle of the hunter to stop the hound, will sometimes stop the rabbit also. Even the clicking when setting the hammer of the gun will check the poor dazed thing in its flight, for it must know what the unusual sound is. True the pause is only for an instant, but that is enough for the sportsman's aim. In the woods the rabbit will course through the underbrush, then, after making a tremendous leap at right angles, will double his track. These movements it will vary with zig-zags, greatly bothering the hounds; not seeming to look for a hole unless it be closely pressed, and a hollow tree offers an illusive asylum. In cleared land it makes for a known hiding place. And generally it knows all the good spots in a wide territory. My friend, Mr. Geo. H. Vanderbeck, an intelligent farmer, gives me the follow-

ing: Once after a heavy fall of snow he marked a rabbit trail at considerable distance from the house. It led in a straight line to the hennery, in which the game was found, having sought this shelter from the cold. From the directness of the trail it was evident that the animal had full knowledge of this retreat. He told me too of an old buck which he had often tried to take, but which would either by a direct or circuitous route, retreat to a deserted marmot's or woodchuck's hole, which it had long occupied.

Two distinct kinds of tracks have been mentioned, that which is made in retreat and that which is made when foraging. To these a third must be added having two sets of imprints, in lines close and parallel to each other, and the step-marks at very short distances. These are the courting tracks. At the turn of midwinter, or about the beginning of February the male looks up his mate or mates. While the love emotion is on, prudence is off; hence, less cautious than usual, they do fall into some indiscretions which imperil their safety. In truth it is with these simple folks much as it is with some thought to be wiser—when much love is in, some wit is out. If the snow or the ground be soft, these double-tracks, or courting ways, betray what is going on, and sometimes the nearness of the lovers. Our rabbit likes a bit of play in the evening twilight and the early morning dawn, hence it has been called a crepuscular animal. But it is essentially a nocturnal, like the rodents generally; and the evening and the morning are its wooing day. The connubial impact made, the doe has much to pull through, for the gay father is away with other loves. If the season prove favorable, three and perhaps four litters are to be raised ere the next winter comes. As an old rabbiter said: "Three crops in one season is only moderate for a she rabbit."

As to the breeding habits of the wood-hare, it must surely have undergone a change in the well populated places east. A thorough hunter tells me, he has never found a nest in the woods nor even a very young rabbit there; that for breeding they prefer the cleared land. This habit secures an open look-out and guards against surprise.

But the breeding nest of the gray rabbit is a simple affair. A hole is scratched sloping downward into the ground about eighteen inches. The slope is slight, so that the nest is very near the sur-

face. It has a bed made of dry leaves and grass, and on top some fur or hair, which the mother has torn from her own breast. The litter numbers from four to six. So small is the hole that the mother cannot nestle in it with her young, but she suckles them at the front or entrance, where she adjusts herself, then by a sort of *wuzzling*, not *purring*, sound, she calls the little ones, the call being at once obeyed. The maternal brooding and fondling which impart so much comfort to the mother's care, are unknown to our gray rabbit. During the suckling period she occupies a slight depression in the ground a few yards off, from which the motherly watch is kept. I think she can give the alarm to her little ones, for they will keep well back in their nest and very quiet in time of danger, while the mother from her form will endeavor to divert an enemy. But despite these vigils something may happen to bring the tenderlings to grief. Should they escape preying animals, for the mother is courageous in defence yet the sloping nature of the nest invites the rain, and a storm may drown the whole litter. Then the shallowness of the nest is such that the plough has often turned up all to perish in the cold winds of March. Should all go well, three weeks of suckling will suffice, when they become so large as to crowd their cave-like nest. Now the mother sets them adrift. The rabbit litters when very young, ere it has attained half its growth. A female may have two litters raised before she is a year old.

As already hinted, the male of *L. sylvaticus* gives himself no concern about the little ones, and is of loose morals at best. As for the petted *L. cuniculus*, he is no better than a beastly blue-beard in his own household. But lest all father hares be set down as so depraved, I shall instance, by way of episode, a pretty exception, even should the story seem to some sensational. In the months of May and June, 1860, Professor F. V. Hayden and his party of U. S. explorers, found themselves up in the Alpine snows of the Wind River mountains, where they were detained several days in an attempt to feel their way to the Yellowstone. On the 31st of May Dr. Hayden declared that a new species of hare was around, as he had observed unusually large hare tracks in the snow. As the Doctor expressed himself to us: "The tracks were very large, the feet being wide-spread, and the hair thick between the toes, thus really furnishing the animal with snow-shoes." In June one was captured, and the Doctor named

the species, *Lepus bairdii.* The animal seemed limited to that small Alpine territory. But one specimen was secured, and no more was heard of this hare until 1872, when Dr. Hayden and party were in that region in the months of August and September. At this time five specimens were obtained by Mr. C. Hart Merriam, the naturalist to the Hayden Survey; of these, four were adult males, and all had large teats and udders full of milk. The hair around the nipples was wet and stuck to them, showing that they had just been suckling their young. To make all certain, resort was had to dissection, when the sex was demonstrated. Not only did Mr. Merriam make dissection, but also Dr. Josiah Curtis, a naturalist of the U. S. Geol. Survey, with the same result. In the face of such testimony disbelief would seem discourtesy. This hare is doubtless an Alpine form, says Allen, "inhabiting the snowy summits of the high portions of the Rocky mountains." It has been found as far south as New Mexico. In winter its entire dress is white; but in summer the pelage generally is dark plumbeous, like that of the house mouse, "the feet are wholly white." If not in exquisite taste, it certainly is peculiar—for white satin shoes can hardly look well on large splay feet. It is a pity that as yet nothing has been learned of the female. We want to know more of their family matters. How much of this nursing is done by the mother; or does she relegate all to the obliging father; or are there two broods to be suckled, the first being unweaned when the second one arrives? In the rigor of their mountain home do the leverets need longer nourishing than their little cousins in the plains? The larger rodent, the beaver, allows two litters in the lodge, but the first litter is supposed to be weaned. If a long suckling of the little hares is necessary, so that one litter is not weaned before the other comes, it would be interesting to know if two nests are occupied, the older litter being left for the father to finish their bringing up. The wood-hare east is polygamous. It is hardly supposable that Baird's hare is so too, as that would make his duties as wet-nurse somewhat exacting. If then he is the one husband of the one wife, in every way his virtues outshine all that can be said for his loose kinsman in the east. But we need more light.

The striking out of the hind limbs of an adult rabbit with the claws distended, has often proved more than a match for a cat.

And little wonder that the hind limbs, with their armament of claws should be quite effective when we recall that grand out-fit of muscles, which enables them to make such prodigious leaps. We spoke of the surprise of the immigrant at the lusty kicking of the entrapped rabbit. Such conduct is, however, exceptional, or at most it lasts for a very short time. When taken by the hand, the captured rabbit at first, in its terror, utters a plaintive but musical cry; it is not properly a squeak; and after a few impotent struggles, it is dazed into a passive submission. Thus an adult gray rabbit may be carried lying full length on one's arm, the front toes being loosely held between the fingers, although it has been taken but five minutes from the trap. After a little show of resistance it has submitted to the situation. Once when riding with my daughter, we came upon a gorgeous patch of *Lupinus perennis* by the roadside. I got out to gather some, when a young rabbit sprang out of the glowing bed of purple bloom. It dashed into a heap of brush near by, which enabled me to capture it without inflicting injury. I bore my pretty prize to the carriage. But though only for a moment, that plaintive whistle in the minor key, so flute-like and so pitiful, kept piping in our ears. Our hearts misgave us. Daughter plead for the little prisoner's release; that decided the matter. I bore it gently back to the bed of lupines, where it easily hid itself, and like a helpless little prince was safe under the royal purple.

This almost non-resistant quality of the gray rabbit, has given me a liking for it. It is your pampered tame one that excels in the mulish accomplishment of kicking at his master. But when "striking out" becomes a virtue, the mother gray-back has been known to shine. Once when inspecting the animals of a certain institution, unconsciously I was getting too near a long-eared mongrel, at which his tender shouted: "Keep away from that mule or he'll stoop up at you, and if you do excite his upsetting sin you'll get his compliments, and you won't forget it either!" We ejaculated: "The long-eared hybrid!" "Yes, sir, that's so," responded the animal-man, "he is high bred. His father before him was a good trick mule." What sharp observers these "animal-men" are. Who but the mule-man could so tersely describe the precise pivotal politeness of the beast. And what method in his salaam to a stranger. First the ears are set well back. Next, down goes the head, then, as if this formalist were fulcrumed at

the middle, upward and backward go the heels; and the impression made is not to be forgotten. But for real "fancy sparring," no trick-mule could equal the deftly hitting of that mother gray-back who fought a huge black snake to rescue her young one. The reptile was rapidly bearing it away. A little low cry, though at quite a distance, was heard by the mother-hare, for their sense of hearing is marvelously keen. A few desperate leaps and she had caught up and joined issue with her dreadful foe. The snake dropped its prey, its sulphurous eyes glowed in luminous rage, and it sprang. But the heroic mother leaped into the air, making a curve over its enemy, and just at passing the middle of this arc putting in most deftly a double shot behind, which sent the serpent rolling and squirming in the dust. This feat was several times repeated, the snake darting and snapping wildly, until its mouth was filled with hair, without inflicting any real hurt on the little heroine. The reptile was cowering fast and would fain slink away; but the witness of this fierce battle now came to the rabbit's aid. The black reptile was soon destroyed, and the brave mother left to her little one.

I think the above should warrant a clear distinction between timidity and cowardice. It is the bravery of maternal desperation. Though succumbing at last, I have witnessed a gallant fight of a young rat with a large pine snake (*Pituophis melanoleucus*). These very serpents are fond of young rabbits, and will capture them much as they do birds. Call it enchantment, fascination, charming, or what one will, there is a fearful nervous subjection. The poor little beast loses head. A farmer in the Pines told me that he saw at some distance up the road, a half-grown rabbit, and was somewhat surprised to see that it did not stir at his coming, but looked steadily at one spot. There was a large pine snake slowly crawling up to its victim. Said he: "I went up to the rabbit, gave it a push with my foot, when it went off at a lively gait. You see the spell was broken. The snake seeing me, made for the woods and got away.

The mink and the weasel are especially feared by the wild rabbit. In Europe the ferret is used to hunt rabbits. If our common weasel appears in a neighborhood, the rabbits will soon be exterminated for a considerable area.

In the winter the gray-rabbit is very destructive to young trees, and is the dread of the nurseryman, although much mischief laid

to them is chargeable to the field mice, which will bark trees both below and above the snow line. The rabbit will girdle young trees, and the very small trees of the nursery it will not only bark, but will cut off the branches and eat them. I have in mind a nurseryman who had not yet learned this fact, and would not permit a gray rabbit to be in any way molested on his premises. The tender hearted fellow soon woke up to his mistake. The animals became emboldened and took possession, and very soon many thousands of young trees were utterly ruined. At last, in dismay, he besought the help of his neighbors, and a war of extermination was proclaimed.

Could it be got at, the ancient lore as touching the ancestry of *L. sylvaticus*, would be well worth the telling. Even before history began, though a numerous, the coneys were always a feeble folk, and fair game for all animals carnivorously inclined. In classic Greek we find a word meaning "killing of hares," and the word hare a synonym for coward. And as for the poor fellow who was harried or hen-pecked, their philosopher Posidonius would say: "he led a hare's life." If remoteness of origin may count for much, the ancestry of the hares is extremely ancient. I am puzzled by a small fossil bone now lying on my table. It is from the Dakota Miocene, and is part of the left side of the under jaw of a hare. There are a number of these fossil or extinct American hares, for which Professor Leidy raised the genus Palæolagus, "the ancient hare." This jaw is, I think, that of a young individual, but I dare not guess the immense remoteness of that period in which it had to fulfill its mission as a prolific food provider for the numerous and terrible Felidæ then existing. Probably the environment or life conditions of the Leporidæ have improved since the Miocene times; for my fragment has the five molars so strongly set, and yet so small, that the owner surely was a smaller animal than our gray-rabbit, itself so small among those to which it is germane, as to merit the epithet familiar to naturalists—"the little wood hare." I think the ancient could not achieve the deft leaps of the modern. As I see it, the body was shorter and thicker set, and its pug face, could a fancier but imagine the style, would educe the fancy name, "chunky chaps."

As already seen, the wild rabbit is very prolific; hence it is the only one of our large rodents that in any measure holds its own against the onflow of civilization. And yet its enemies are many

Even the domestic cat will take to the woods and become almost a fera, and subsist largely on young rabbits. To man with dog and gun, the pursuit of the rabbit seems to have a fascination. To me, the yelping bark of the hound when he has scented the little thing, is always distressing. Old rabbit hunters claim that the three different kinds of sounds, when the dogs are baying, denote different grades of strain in the hounds. There is the short snappish yelp of the hound of low degree; the whining, yet almost percussive howl which marks the dog of fair and even good points; then there is that long-drawn, deep-mouthed baying which leaves that ancestral war-whoop far behind—

"The wolf's long howl on Ounalaska's shore."

This can be heard far away, and denotes the hound of highest strain. I dislike them all, but this specially exaggerated wolfish baying is to me indescribably dismal. But judgments differ. Doubtless the devotee hears music in the frenzy of the howling dervish. I knew the father of a necessitous family. He kept one of these fiendishly accomplished brutes. The man must have had not an ear but two, for music, the one sa a pietist in church, the other as an enthusiast afield; for he said to a fellow sport: "In meetin' I have my favorite hymn, but the sound of that hound when he has nosed a rabbit, is to me real heavenly music!" As the poor miner declared, when half dazed over the death of his chum, this whole business is "too technical for me!"

I am so much pleased with the sight of little gray-back in the orchard near my study. With no dog near, he is in an interesting repose, and the scene is innocent and pretty. In the confidence of safety, it squats, snips off at its base a dandelion leaf, then sits up, and enjoys the crispy dainty. What a picture—ears erect and wide open; and that nibbling or clipping diminution of the leaf, those soft staring eyes, and that funny winking mug. Now for that habit of circumspection. Poised on its hind feet, with neck a little stretched, how those lustrous eyes survey the situation, while the ears are set erect and expanded to catch the slightest sound. Ah! it has heard something, and off it goes at almost flying speed, bearing that cottony caudal tuft aloft behind it. If for mere display that white cockade may suggest a spice of vanity in rabbit life; but if from other motives it may hint at some serious verities in its experience. If it be the "white feather," who will blame timidity where every hand is

hostile? if a flag of truce, it has never been regarded. How much this little mammal has to do in sustaining the faunal balance in the east! To how many forms of life is it a food supply —to the creeping reptiles, the raptores of the birds, the rapacia of beasts, and even all-rapacious man. "Behold, therefore, the goodness and severity of God." Such is the rectitude of existence that whether beast or man, "no one liveth to himself, and no man dieth to himself."

> "The whole temporal show related royally,
> And built up to eterne significance,
> Through the open arms of God."

But why tempt the depths? So here endeth this memoir of "little cotton tail."

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THE PALÆOZOIC ALLIES OF NEBALIA.

BY A. S. PACKARD, JR.

HAVING studied the anatomy and development of Nebalia, we are prepared to compare it with a group of fossil forms which are scattered through the older Palæozoic rocks from the lowest Silurian to the Carboniferous. In a brief article[1] Mr. Salter, nearly twenty years since, sketched out the characters and showed the relationship of Ceratiocaris and a number of allied forms to Nebalia in the following paragraph:

"Before the structure of Ceratiocaris was known, of which genus a reduced figure is here given, the rostral portion of Peltocaris could not have been understood. But a reference to the accompanying series of wood-cuts[2] will show that a tolerably broad rostrum, placed in the same relative position, occurs in Ceratiocaris. In the recent Nebalia it is fixed, and in Dithyrocaris and other genera it is perhaps yet to be discovered. Again, Ceratiocaris, together with its movable rostrum, has a bivalved shell, yet habitually keeps its valves half closed, as I learn from perfect specimens."

Salter then enumerates the characteristics of the fossil genera, beginning with Hymenocaris, which he considers the more generalized type, and in the wood-cuts, which we partly here produce, shows the geological succession of these genera, which also serves as a genealogical table. He regards them as Phyllopods, associating with them Estheria and Apus, regarding the latter as

[1] On Peltocaris, a new genus of Silurian Crustacea, by J. W. Salter, Quarterly Journal of the Geological Society of London, Vol. XIX, 1863, p. 87.

[2] Our Fig. 1.